

infusion was injected into the rectum of a dog whose head had been cut off, and whose respiration was kept up by artificial means, the heart continued to act in the same manner as in the experiments which Mr. Brodie lately communicated to the Society, without being sensibly affected by the infusion.

The author's trials of the *external* application of poisons were confined to the essential oil of bitter almonds, the juice of aconite, and the South American poison called Woorara. They all produced the same effects as the two former had done when applied *internally*, for the heart was observed to contract, as before, long after other symptoms of life had ceased; so that the circulation could be kept up by means of artificial respiration.

With respect to the medium through which poisons affect the brain when they are applied to external wounds, the author's experiments were confined to the woorara. And he endeavoured to determine whether the influence was conveyed by the nerves, or whether the poison itself entered the circulation, either by the absorbents, or through the divided veins. By dividing the nerves of a part, the efficacy of the woorara did not appear diminished, neither did tying up the thoracic duct in any degree interfere with its action. But when a ligature was applied round the leg of a rabbit, so as not to include the sciatic nerve, the rabbit was not in the least affected by the woorara.

The author consequently infers that the woorara acts upon the brain by passing into its substance through the divided vessels of the part to which it is applied.

Since the circulation of an animal could be kept up by an artificial respiration, after the brain had been even completely removed, Mr. Brodie conceived it possible that the functions of the brain might be found to recover from temporary suspension if the circulation were continued for a time by artificial respiration, and that thus the life of the animal might be preserved.

After two experiments, which were not attended with complete success, a third was made upon a rabbit, by applying distilled oil of almonds to a wound in the side. In five minutes it ceased to breathe, and was apparently dead; but by means of artificial respiration continued for sixteen minutes, it was completely restored to life; and on the following day appeared not to have suffered from the experiment.

On the Causes which influence the Direction of the Growth of Roots.

By Thomas Andrew Knight, Esq. F.R.S. *In a Letter to the Right Hon. Sir Joseph Banks, Bart. K.B. P.R.S.* Read March 7, 1811. [*Phil. Trans.* 1811, p. 209.]

In a former paper Mr. Knight showed the influence of gravitation on the plumule and radicle of germinating seeds; in the present he considers the fibrous roots, which, with little comparative regard to gravity, extend themselves in whatever direction the greatest nutriment or moisture is to be found, with an appearance of predilection,

which some naturalists have been disposed to compare to animal instinct. Mr. Knight examines whether this comparison has any foundation.

He remarks, that when trees which require moisture are near to water, by far the greatest part of their roots extend themselves in that direction; but when those to which a dry soil is more congenial are placed in the same situation, their roots take an opposite course. When a tree is placed upon a wall, at a distance from the ground, its powers appear directed exclusively to one object; its roots are extended with well-directed efforts to reach the soil beneath, while its branches are in the mean time stunted in their growth; but as soon as the roots have entered the soil, the branches then grow with vigour and rapidity.

Mr. Knight sowed some seeds of the common carrot and parsnip in light poor loam, under which, at the depth of eighteen inches, he had placed a stratum of very rich mould, incorporated with fresh vegetable matter. The plants grew feebly till the end of summer, but then assumed a very luxuriant growth; and when the roots were examined, they were found nearly cylindrical, with very few fibres emitted into the superficial poor soil, whilst the rich mould beneath was filled with fibres.

When the strata of soil were reversed, the roots were found to have formed accordingly, ramifying, in an unusual manner, into the superficial rich soil, but emitting few of their fibres into the subjacent stratum.

When mould contained in an inverted garden-pot was so supported by frame-work that its under surface was exposed to the air, the radicles of garden-beans in contact with this surface extended horizontally along it, and in a few days emitted many fibrous roots upwards into the mould; but they appear to the author to be guided by laws far more simple than animal instinct.

For the explanation of these laws he refers to the known powers of the alburnum of the stem and branches, by which the sap is propelled, without assistance from the roots, in such proportion as each has power to employ; that which is exposed to the light attracting to itself a larger portion of the ascending sap, for the formation of leaves and of vigorous annual shoots, while those that are shaded are comparatively languid and unhealthy. In the same manner, the author is of opinion, that the stimulus of proper food and moisture in the soil upon the bark of the root may give ability to that organ to attract and employ a larger portion of the descending current of sap. Those roots of a tree upon a wall, that are the worst supplied with moisture, will be first affected with drought, and their points will become rigid and cease to elongate, and the current of descending sap will be employed in the elongation of those more favourably circumstanced, and the tree will appear to have adopted as wise a plan as it could have done if it had possessed the feeling and instinctive powers of animal life.

The cylindrical roots of the carrots and parsnips, in the first experi-

ment, as well as the branched and taper roots of those sown in a soil superficially rich, admit of a similar explanation. So also when the seeds of the bean were placed to vegetate beneath the mould of an inverted pot, the lower surface of the radicles, being exposed to dry air, were rendered rigid and incapable of emitting fibrous roots; while their upper surface in contact with the mould, being preserved in a due state of moisture, emitted fibres in that direction alone in which proper food was to be procured.

In confirmation of this explanation, the author made a corresponding experiment, in which water was so constantly and abundantly supplied, that every part of the radicles was kept equally wet, and then they emitted fibres perfectly obedient to gravitation, without being influenced by the soil above them.

The strength of roots, by which they appear to be wisely adapted to their situations of exposure to the violence of winds, is traced by the author to the operation of another cause, noticed in a former memoir; for the immediate consequence of motion upon the roots, as well as upon the branches, is a deposition of alburnous matter upon the part moved; and hence those roots which immediately join the trunk of an insulated tree become strong and rigid, but diminish rapidly in bulk as they recede from the stem and descend into the ground. But in a sheltered valley, on the contrary, where a tree is protected by its neighbours, and little agitated by winds, the roots grow long, and continue slender like the stem and branches, and hence comparatively much less of alburnous matter is expended beneath the ground.

In the whole of this arrangement the author sees much reason to admire the simplicity of the means employed by the wisdom of nature, but is unable to trace the existence of anything like sensation or intellect in the plants themselves.

On the Solar Eclipse which is said to have been predicted by Thales.
By Francis Baily, Esq. Communicated by Humphry Davy, Esq.
Sec. R.S. Read March 14, 1811. [*Phil. Trans.* 1811, p. 220.]

Notwithstanding there may be few facts in ancient history which have given rise to more discussion, this subject still appears to the author to admit of elucidation; for though chronologists have availed themselves of the aid which astronomy could give them in fixing the exact time when this event occurred, and thereby ascertaining the dates of several other events, yet among the various periods assigned for this eclipse by different authors, we find a difference of no less than 43 years between that assigned by Scaliger, who supposed it to have happened on the 1st of October, 583 B. C.; and that supposed by Volney, in his *Chronologie d'Hérodote*, who fixes it on February 3, 626 B. C. The results to which most confidence has been hitherto attached, is, in fact, very nearly the mean between these extremes, and is that preferred by Bayer, in his *Chronologia Scythica*, published in the Petersburg Memoirs for 1728.